Supplementary Information for the manuscript

Uneven onset and pace of ice-dynamical imbalance in the Amundsen Sea Embayment, West Antarctica

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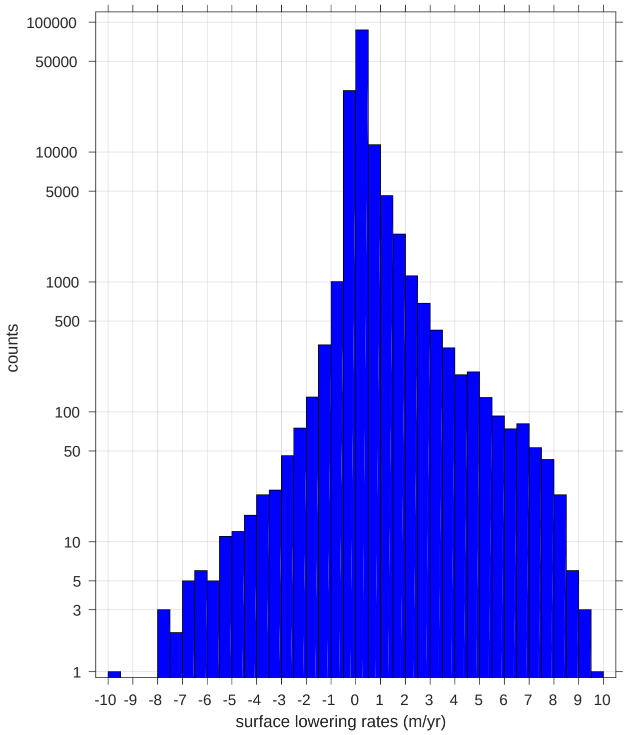

Figure S.1: Histogram of surface-lowering rates values in the complete data set before spatial smoothing is applied. The number of data points exceeding ±9 m/yr is five (total: ∼140k), indicating that a 10 m/yr threshold for absolute values of surface-lowering rates is plausible for discarding unrealistic outliers. Note the logarithmic scale of the ordinate.

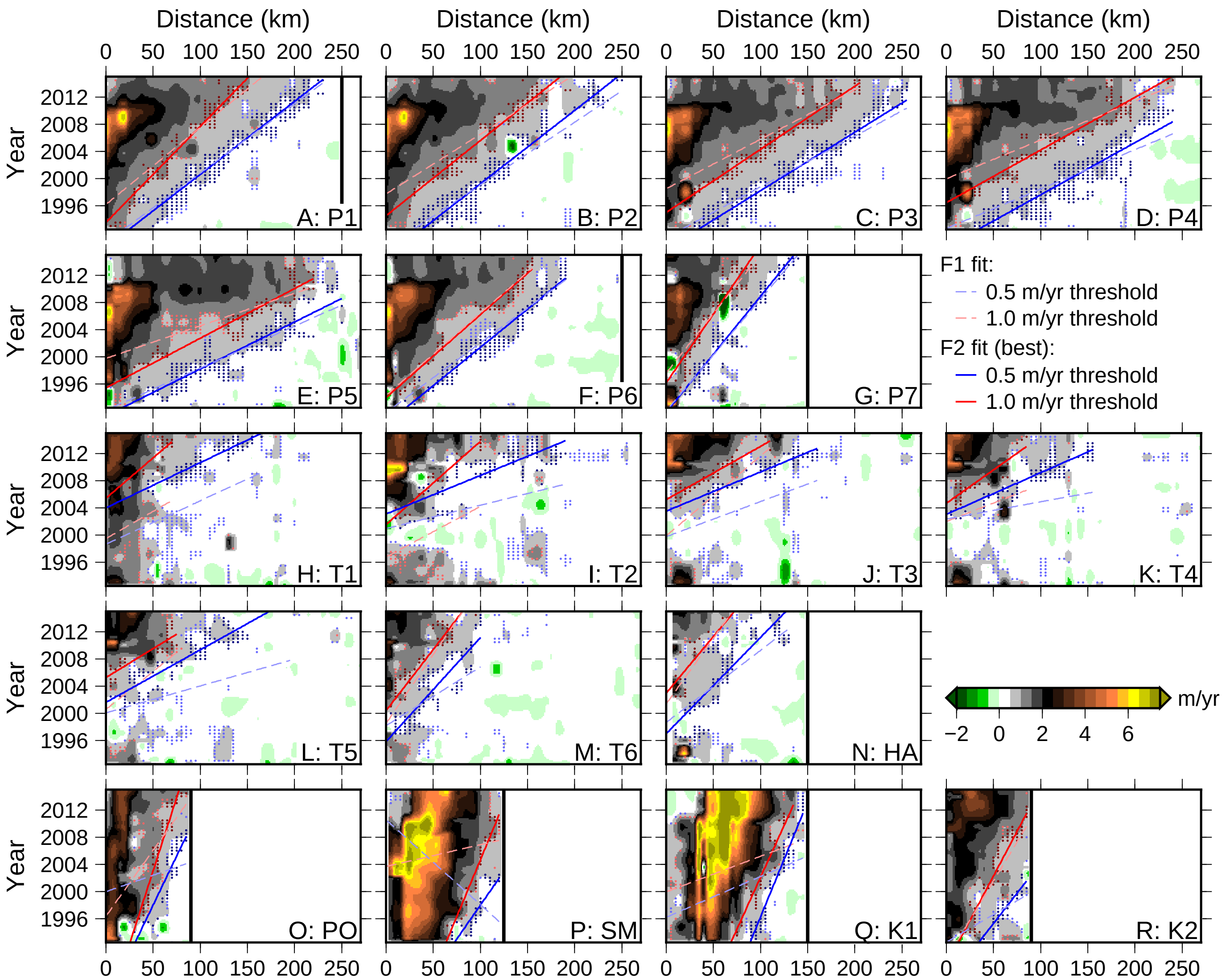

Figure S.2: Surface-lowering rates along the defined flowlines (compare Figure 2). The location of the flowlines is shown in Figure 3. Distance is taken from the grounding line (Bindschadler et al., 2011). Vertical black lines indicate that the respective flowlines are not tracked beyond those distances as the surface velocity (Rignot et al., 2011) falls below 10 m/yr. The F1 fit (dashed bright lines, blue for the 0.5 m/yr threshold, red for 1.0 m/yr) is based on the data given by the respective dark and bright colored markers; the (best) F2 fit (solid colored lines) is based on the data marked by dark colors only. Results of the F1 and F2 fits are summarized in Table S.1.

	0.5 m/yr threshold			1.0 m/yr threshold		
	spread. rate (km/yr)	init. at GL (year)	r^2	spread. rate (km/yr)	init. at GL (year)	r^2
P1	9.3 ± 0.5	1989.9 ± 0.7	0.94 (0.77)	7.1 ± 1.4	1993.5 ± 2.7	0.94 (0.54)
P2	9.2 ± 1.4	1988.4 ± 1.5	0.93 (0.59)	9.0 ± 1.9	1994.5 ± 3.2	0.92 (0.49)
P3	11.6 ± 1.5	1989.6 ± 1.7	0.90 (0.59)	10.7 ± 2.3	1995.0 ± 3.5	0.92 (0.53)
P4	13.0 ± 3.2	1989.9 ± 2.7	0.80 (0.33)	12.9 ± 3.4	1996.4 ± 3.5	0.87 (0.42)
P5	14.5 ± 1.5	1991.3 ± 0.8	0.84 (0.48)	13.7 ± 4.7	1995.4 ± 4.3	0.86 (0.38)
P6	8.9 ± 0.8	1990.1 ± 1.7	0.92 (0.70)	8.2 ± 0.1	1994.0 ± 0.3	0.96 (0.86)
P7	5.8 ± 0.2	1991.8 ± 0.2	0.94 (0.69)	4.9 ± 0.7	1996.2 ± 1.5	0.86 (0.45)
T1	15.0 ± 0.6	2004.0 ± 5.3	0.87 (0.14)	8.4 ± 2.7	2005.4 ± 5.9	0.73 (0.34)
T2	17.6 ± 6.9	2003.1 ± 2.2	0.63 (0.08)	8.2 ± 3.2	2001.5 ± 4.8	0.94 (0.28)
T3	17.3 ± 1.8	2003.5 ± 3.8	0.86 (0.27)	12.8 ± 6.4	2005.2 ± 5.3	0.89 (0.29)
T4	16.3 ± 9.6	2003.0 ± 0.7	0.80 (0.07)	10.2 ± 4.6	2004.7 ± 2.7	0.78 (0.12)
T5	12.9 ± 6.3	2001.6 ± 1.5	0.82 (0.08)	11.7 ± 3.7	2005.3 ± 4.7	0.79 (0.30)
T6	6.5 ± 2.8	1995.8 ± 2.3	0.77 (0.29)	5.6 ± 0.7	2000.4 ± 1.9	0.82 (0.53)
HA	7.0 ± 1.8	1997.0 ± 1.7	0.71 (0.21)	6.0 ± 1.0	2003.0 ± 1.6	0.69 (0.39)
PO	3.5 ± 4.2	1983.5 ± 22.3	0.82 (0.18)	2.3 ± 2.3	1981.5 ± 22.2	0.89 (0.00)
SM	5.0 ± 8.2	1978.1 ± 32.5	0.76 (0.35)	3.0 ± 2.7	1971.3 ± 32.4	0.88 (0.02)
K1	2.9 ± 2.4	1962.3 ± 33.9	0.94 (0.13)	3.3 ± 2.7	1971.5 ± 28.4	0.89 (0.18)
K2	5.6 ± 3.0	1986.4 ± 6.2	0.85 (0.25)	3.8 ± 0.5	1989.2 ± 0.9	0.84 (0.50)

Table S.1: Similar to Table 1 in the manuscript, but containing information on the goodness of fit r^2 in addition to spreading rates along flowlines (inverse slopes of F2-fitted lines in Figure S.2) and initiation years at the grounding line (GL; intercept of F2-fitted lines). Uncertainties are calculated as difference of F1- and F2-fitted parameters. The bracketed r^2-figures relate to the F1-fits. On PIG, the F1 fits are fairly good, with r^2 between 0.33 and 0.77, whereas r^2 for F2 is always above 0.8 and mostly above 0.9, indicating that the best fit strategy is adequate. On THG, the r^2 values of the F1 fits are partially close to zero, due to the disturbed pattern in this basin (episodes of surface lowering, see main text). The F2 results on THG are better, largely above 0.7. However, the goodness of the fits is worse than on PIG and the discrepancy between F1 and F2 leads to larger uncertainties for initiation years and spreading rates. As on PIG, the F2 results in the PSK basin (PO, SM, K1, K2) are mostly accompanied by r^2 >0.8. The mispostioning of the grounding line along these glaciers leads to a strong scattering of data points for the F1 fit und thus to poor fit quality (down to $r^2 = 0$) and to large errors for the initiation years and large relative errors for the spreading rates.

References

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